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# **Seriously Ceres?**

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## **Abstract**

Within maritime logistics the containerised trade market is growing rapidly with the uprising of the Far East. European container port competition among the ports in the Le Havre-Hamburg range is fierce as they are threatened by a shortage of terminal capacity. The port of Amsterdam identified this threat and realised a brand new container terminal, the Ceres Paragon Terminal, in 2002. Characterised by a revolutionary concept known as an indented berth, served simultaneously by nine ultra modern post-Panamax gantry cranes, productivity levels should be raised to over 250 picks an hour. Although the odds seemed favourable for the new terminal, enthusiasm was replaced by vexation. Three years later the terminal has not yet served a single contract client since it became operable. And the future does not look bright. Their main Rotterdam based competitor, ECT, is planning a take-over that could make or break the future of the Ceres Paragon Terminal.

The objective of this paper is to study if the failure of the container ambitions of Amsterdam can be traced back to main port choice criteria or port performance, identified in literature.

**Keywords:** container, terminal, choice criteria, performance, competition, Amsterdam

## **Introduction**

The growth in seaborne trade of containerised cargo has outstripped the growth in world trade in general and world economic growth in particular since the introduction of the container during the 1950s on the West-East /East-West long haul trades. As we speak volumes of containerised cargo are still growing relatively rapidly. More diverse cargo is being containerised and export and imports increase on a global scale. The relatively high growth rate for the global containerised trade is initiated by the strong uprising for the developing and transitory countries with respect to their trade volumes. Within these groups of countries Asia is responsible for the highest containerised cargo volumes in global trade, nowadays, and determines the containerised trade scene to a large extent. The containerised trade sector benefited especially from the strong growth of the Chinese economy. To keep up the pace and provide for the necessary capacity and tools to

tranship these massive volumes, container ports worldwide should be responsive and on guard in order to retain their levels of competitiveness.

The main stakeholders within the container transport chain are carriers, terminal operators, port authorities, regional and national authorities, transport companies and, of course, the clients, *i.e.* the shippers of the containerised goods. Government organs set up a protocol for port authorities for granting port access and (partly) provide for infrastructural development. The actual port control on a daily basis lies with the port authority. This organ grants access to vessels and provides infrastructure for terminal areas. In return they receive payments. The terminal operators run actual operations on a daily basis. A cash flow is generated through transshipment of containers thereby serving the carriers. The terminal and carriers usually work according to contractual agreements. The containers find their way to and from the hinterlands through continental transport companies. The relationships between the main stakeholders are summarised in Figure 1. In this article, the emphasis will be on the three stakeholders that are directly involved in the money flows; the port authority, terminal operators and carriers.

#### XXX INSERT FIGURE 1 XXX

In Europe, the leading container ports showed a last year's increase in container throughput of approximately 15 percent. Several of the ports located in the European Le Havre-Hamburg range are struggling with the enormous amounts of containerised cargo. Since terminal capacity and throughput to the hinterlands are under strain on the short term competition between the ports, with respect to future growth, increases. New projects with respect to capacity increases are deployed by established container ports as well as general and smaller ports and port areas, not recognised as container ports. One of these ports is the port of Amsterdam, established as an important bulk port but without any significant number of container transshipment.

In the middle of nineties the Greek-American stevedore Kritikos, chairman of Ceres Terminals Incorporated, appeared as the redeemer of the port of Amsterdam. He would establish the 'container port' Amsterdam by giving the city the world's most beautiful container terminal, capable of handling at least 650,000 containers a year. He did so, by realising the Ceres Paragon Terminal in 2001.

Giants they are, the nine state-of-the-art cranes of the Ceres Paragon Terminal located on the quay at the 'America' port, in the western Amsterdam port area. They are rated by port technicians as the fastest, most efficient and quietest cranes in the world, able to serve container vessels of all sizes, including the 'post-Panamax plus' container vessels. According to plans, approximately 300,000 containers should have been transhipped at the terminal in 2004, to eventually rise to 650,000 in 2005. As we speak, the terminal has not handled a single contractual container yet and finds itself entangled in a hostile take-over by its giant Rotterdam competitor, the European Container Terminals (ECT) [Parool, 2005].

The container ambitions of the port of Amsterdam and the arrival of the Ceres Paragon Terminal were based on present market development for the containerised trade sector.

At first sight the developments opened up major opportunities. But it became clear in the years following that there was more to it than just opportunities for the container terminal. The alarming but also interesting situation the port of Amsterdam finds itself in, in the absence of client and leading to a great deal of uncertainty for the future, calls for an analysis.

This article finds its objective in clarifying causes for the failure of the Ceres Paragon Terminal. Container port choice criteria, favoured by the main stakeholders identified earlier, create the basis for this article. We will introduce them in the next section. What follows in the section thereafter is an introduction on the port of Amsterdam and the Ceres Paragon Terminal in particular. In the section on port analysis we utilise the port choice criteria as a tool to review the potential of Amsterdam in its favoured role of container port. We discuss the future for the container port of Amsterdam in the final section. In the concluding remarks we finally arrive at a statement regarding the failure for the port's container ambitions and the Ceres Paragon Terminal.

## **Port Stakeholders' Interests**

This section offers a framework for the analysis on Amsterdam's container ambitions. We will start with the introduction on port choice criteria, since these explain the initial choice for a particular port. These criteria do not guaranty the continuity of the port, however, as there is more to it than this initial choice. Actual port performance will be our next point of discussion where we will introduce the topic of delay and waiting times. Port performance will depend on terminal productivity and service degree to a large extent.

### **Container Port Choice Criteria**

The routing for a container transport is dependent on the choice of port(s) in the region of origin and the region of destination. Nowadays there is a considerable wide choice in container ports that are all within the perimeter of these regions. An example is formed by the ports in the European North Sea-region (see Figure 2). The North Sea ports in the Le Havre-Hamburg range handle a large part of the container traffic to and from the European continent. The ports of Hamburg, Bremen, Rotterdam and Antwerp are the largest ports in the region. Shippers and receivers located in, for example, Ludwigshaven (Germany), have the choice to tranship their containers, to and from the Far East, via different combinations of [Veldman and Bückmann, 2003]:

- Shipping line
- Port of call
- Inland transport mode (train, truck, barge)

XXX INSERT FIGURE 2 XXX

With, say, 20 carriers, four ports of call and three modes of inland transport (though not all combinations are relevant) the number of different routings, serving a particular region, easily exceeds 100. For routings including a hub-port, focussing on sea-sea transshipment, the number of options is even greater.

In literature a large set of port choice criteria has been presented [Lirn *et al.*, 2004; Song and Yeo, 2004]. These criteria can be classified in four main criteria corresponding to the port's physical and technical infrastructure, its geographical location, its management and administration perspective and its carrier and terminal cost perspective. These four main criteria hold a number of sub-criteria on port choice. Previous research [Kroon, 2004; Lirn *et al.*, 2004; Notteboom, 2002; Song and Yeo, 2004] ranked these with respect to importance based on main stakeholders, *i.e.* carriers, port operators, port authorities and shippers. Namely,

- Handling cost of containers
- Geographical location:
  - Proximity to main navigation routes
  - Proximity to import/export areas
  - Proximity to feeder ports
- Basic infrastructural condition
- Intermodal links

The handling cost criterion is emphasised by the main stakeholders. The degree of importance for the rest of the criteria differs slightly among the main stakeholders. Intermodal links, for example, are particularly valued by the shippers. The basic infrastructural condition is an important port operator aspect. Carriers are more concerned with the proximity to main navigation routes as costs vary considerably with deviating routes [Kroon, 2004].

Extension of the discussion on port choice will eventually lead to a discussion on the port of choice's (and terminal's) performance. This provides a tool for measurement of the quality of the actual transshipment process. It provides a basis for remarks concerning the port's potential, stability and continuity.

### **Container Port Performance**

Productivity and efficiency are the two most important concepts in port performance, especially from the perspective of its main clients, *i.e.* the shippers and the carriers. Productivity of a producer can be loosely defined as the ratio of output(s) to input(s). Efficiency can be defined as relative productivity over time or space, or both [Wang *et al.*, 2002]. Both are measurements of performance.

The discussion on port choice criteria has demonstrated that the location and cost criteria are important in the initial port choice process. Costs and location are not directly, although they are indirectly, related to a port's (and terminal's) performance. Criteria that are categorised under the port's physical and technical infrastructure and its management and administration focus many variables directly responsible for port's performance [Kroon, 2004]. Many of these criteria, however, have been subordinated to the cost and location criteria identified by the main stakeholders. Examples are the port's technical structure and vessel's turnaround time, both sub-criteria, respectively.

As a consequence from the emphasis on cost and location criteria, 'bigger' or 'busier' does not always automatically mean 'better', phrased by the saying *King of the hill does not always mean prince of ports* [Sowinski, 2002]. Ports frequently called by carriers, usually corresponding to the very large ports, do not automatically offer performance

levels substantially higher compared to ports being less frequently called, usually corresponding to smaller, regional ports.

Understanding performance is a concept fundamental to any business. Ports are no exception and it is only by comparison between them, with respect to time intervals, cost structures and service degree, that performance can be properly evaluated. Ports are, however, complex entities with many different sources of inputs and outputs which make direct comparison among apparently homogeneous ports difficult. Various port types [Langen *et al.*, 2002] and port ownership and organisational structures, existing throughout the world, complicate it further. Since our research goal needs a positioning of the port of Amsterdam, comparisons between the port and its competitors will be made up to terminal level in the section starting hereafter. Before we enter that topic the relationship between a port's performance and vessel's waiting time will be introduced.

### **Average Waiting Time for Container Vessels**

The performance of a port, from the perspective of the main stakeholders, directly corresponds to the average waiting times encountered by its clients. Important factors that contribute to waiting time are the delays in port transit and delays at the (terminal) quay.

The average waiting times encountered by vessels at a specific port are important for economic comparisons of the different situations, as time means money these days. Waiting times have a large impact on the total time of the vessel spent in the port. Frequent and/or increasing waiting times for vessels calling a specific port can have negative consequences for the number of vessels visiting that port, depending on the extent of the delay and the port's (economical) importance. Comparison of the present waiting times with forecasted waiting times might help to create a future perspective for the port [Temmerman, 2002].

Costs for bulk transports that are the result of additional waiting times, caused by unexpected delays, are relatively low: 1.4 eurocent per ton per hour (t/h) for dry bulk and 4.5 eurocent per t/h for wet bulk. For container vessels, however, the costs accompanying waiting time are much higher since container carriers adapt a line services system; at least 8.2 eurocent per t/h [CPB, 2003]. Unexpected waiting times can cause maladjustments from sail schedules that can lead to negative consequences for later links in the transport chain. Moreover, the container transport often concern (expensive) industrial goods. Bulk carriers do not adopt a line service, use vessels that are relatively cheap and transport relatively cheap goods.

In its shift from a bulk to a container port, Amsterdam should keep in mind these important differences between both cargo forms and the consequences it has for port operations.

### **Reconsidering Port Choice**

When a particular port of choice is not able to offer desired levels of efficiency and performance or charges tariffs that are unsatisfactory, carriers and shippers will reconsider their port choice. The decision to continue or cease calling that particular port is a complex one, however. Costs accompanying a change of preferred port of call have to be offset by higher revenues generated with the new port of call.

Besides the cost-revenue balance such a change process creates a considerable amount of uncertainty as well. If the new port of choice does not live up to their clients' expectations a smooth return to their initial base port will not be easy. As container terminal capacity is scarce idle capacity will be seized immediately by others. Carriers that want to return to their former base port might end up waiting in line for available terminal capacity and risk the loss of past privileges. Carriers and shippers might therefore reconsider a possible port shift as uncertainties add up. The power of the established terminal operators seems to be considerable therefore.

With a theoretical basis, consisting of port choice criteria, port performance, its correspondence with waiting times, and the power of an established port, the port of Amsterdam will be analysed in the next section. The section starts with an introduction into the Amsterdam port area. From that point it will narrow down to the Ceres Paragon Terminal.

## **The Port of Amsterdam**

The Amsterdam port and its 'satellite' ports (Beverwijk, Velsen/IJmuiden and Zaanstad) are ranked sixth within the EU with respect to total throughput volume (tons) [Amsterdam Port Authority, 2004b]. The port of Amsterdam has established itself in the North Sea-region as an important bulk port. Vast quantities of dry bulk are transhipped in the port, including goods processed into semi-manufactured products like feed and grain products. Besides these important cargo forms Amsterdam is the largest cocoa port in the world.

The port of Amsterdam is one of very few significant ports to be fully entered through a lock complex. One of the world's largest lock complexes separates the North Sea and the port's access canal. It comprises four locks and is operational 24 hours a day. Only the largest lock, the North lock, is compatible for the latest generations of container vessels. Through the canal, the North Sea-canal, the port area is fully accessible. Figure 3 shows the port entrance and lock situation for the port of Amsterdam.

XXX INSERT FIGURE 3 XXX

Although established internationally as a bulk port, the port of Amsterdam hardly handles any containerised trade, however. With a trend of decreasing bulk cargoes at the expense of increasing amounts of containerised trade the port of Amsterdam has made a disputed attempt, with the realisation of the Ceres Paragon Terminal, to enter the container market.

### **The Ceres Paragon Terminal**

The Ceres Paragon Terminal is realised as a joint project of Ceres Terminal Inc. and the Amsterdam Port Authority. Total investments are estimated at €172 million, of which the Amsterdam Port Authority invested the larger part, €128.5 million in infrastructure and part of the cranes. The remaining part of the investment, € 43.5 million, was made by Ceres Terminal Inc.

In September 2002 the Japanese shipping and transport company, Nippon Yusen Kaisha (NYK) acquired the American Ceres Terminals Inc. along with 50 percent of the shares

in the Ceres Paragon Terminal. NYK ranks ninth amongst the individual container carriers and is a member of the Grand Alliance consortium, holding Hapag-Lloyd Container Line (HPCL), Malaysia International Shipping Corp (MISC), Orient Overseas Container Line (OOCL), P&O Nedlloyd besides NYK [CI, 2004].

The terminal area covers 62 hectares, has a total quay length of 1,050 meters and had an annual capacity of 950,000 TEU. The terminal introduced a revolutionary and unique concept amongst container terminal facilities: A so-called ‘indented berth’ enabled post-Panamax vessels to be serviced by a maximum of nine gantry cranes, having a reach up to 22 containers across deck from *both* sides of the vessel (see Figure 4). This made it possible to enhance productivity to a high standard.

XXX INSERT FIGURE 4 XXX

The indented berth has a length of 400 meters and a width of 57 meters and was designed for the latest generation of container vessels; the post-Panamax plus category vessels. It also offered a classic quay with a length of 615 meters where a maximum of five gantry cranes could be assigned to one vessel. The total berth time of the indented berth is accepted to be within 15 minutes [Ceres, 2004]. The terminal, thereby, seems to be able to offer a full package of services.

## Port Analysis

Port and terminal comparison between the port of Amsterdam and its direct competitors, Rotterdam and Antwerp, although established as massive global container ports already, might be interesting to further explicate Amsterdam’s competitive potential. We will begin with comparing the main terminals in these container ports, forming the basis of the port’s actual performance. The section on port comparison provides feedback on the port choice criteria, important in the initial port choice.

### Terminal Performance Comparison

Although not fully proven in practice (some trials were conducted) the Ceres Paragon Terminal has a very competitive status when productivity level is compared to the competition: the main terminals operating in the nearest global container ports (among other large terminals); Rotterdam’s Delta-terminal (operated by ECT) and Antwerp’s North Sea-terminal (operated by Hesse Noord Natie).

With an average capacity of 25 movements per hour for one gantry crane, the capacity to load or discharge a container vessel with five cranes can theoretically lead to 125 movements per hour. With the introduction of the indented berth concept productivity of the Ceres Paragon terminal was to be doubled to at least 250 picks per hour. The cranes work independently from the transport process regarding supply and evacuation of containers, as straddle carriers are deployed. Turnaround times (and with that, costs) could be reduced to a considerable extent this way, estimated to be in the range of 30-50 percent.

The Rotterdam ECT terminal is characterised by having a huge capacity. Productivity per berth however, remains relatively low (70 units per hour per berth), with a maximum of



five cranes per berth. Productivity of the cranes is also dependent of the productivity of the Automated Guided Vehicles (AGVs) that the Delta-terminal deploys. Antwerp, with its not yet (fully) automated container terminals reaches a somewhat higher productivity per berth; 110 units per hour per berth, one of the aspects that keep the port competitive, besides its favourable prices.

When productivity levels of the two massive terminals are offset against the productivity levels of the Ceres Paragon Terminal the difference is striking. A marginal note must be made here. This productivity level for Ceres Paragon is reached with the indented berth fully serviced by nine cranes. With another vessel berthed simultaneously at the other, classic berth, no more cranes can be assigned to that particular ship. When the nine available cranes are divided over both vessel respective productivity levels will be reached but will not match the massive number of 250-300 units per hour per berth. The other terminals operating the ports of Rotterdam and Antwerp have several berths that can be serviced simultaneously by a constant number of cranes. Overall productivity for the total number of berths can thereby be increased considerably. Productivity levels for Ceres Paragon remain striking however.

Numbers on terminal capabilities are summarised in Table 1

XXX INSERT TABLE 1 XXX

### **Port Choice Comparison**

Terminal comparison led to a satisfactory number on productivity for Amsterdam's Ceres Paragon Terminal. Container terminals are, however, dependent of a large set of port criteria in addition to their independent capabilities. A port comparison between the identified ports is therefore a necessity. Port comparison between these ports will be based on the main port choice criteria identified earlier.

The three criteria that correspond to the port's geographical location seem to be rated in basically the same way for the three ports. The ports are in each other's direct vicinity with the distance between the two most remote ports, Amsterdam and Antwerp, being only a sheer 100 miles. International stakeholders' perception with regard to *proximity to feeder ports*, *proximity to import/export areas* and *proximity to main navigation routes*, seems not to differ to a large extent for both ports.

Although this statement is open to some ambiguity, it is the other important port choice criteria on which findings for the ports might deviate considerably: the ports' *infrastructural basis*, its *intermodal linkage* and its *handling cost of containers*. Besides these choice criteria, to be discussed next, the 'political' role of the main stakeholders will make its contribution to the analysis at a later stage.

The port of Rotterdam, positioned among the largest (container) ports in the world, owes a considerable part of its status and rank to its favourable geographical location. It is centrally situated to the main trunks, either Eastbound or Westbound. It occupies a central position with regard to feeder ports throughout the (West) European continent. And it finds itself in a highly competitive position when it comes to its closeness and its reach, *i.e.* its intermodal network, to the main European import and export areas [Kroon, 2004]. The advantageous and competitive outcomes with respect to these three important main choice criteria are complemented by high ratings for the other identified choice

criteria. The port's nautical access, as a basic infrastructural condition, is quite optimal. It offers an easy and continuous access through a more than sufficient depth. Its intermodal linkage is quite optimal as barge, rail and road networks are extensive and of high quality standard. Container handling costs are competitive, especially since run-up costs to the port are kept low due to the favourable geographical and infrastructural situation. Since the port of Rotterdam seems to have acquired an ideal position with respect to the choice criteria it will serve as a reference point.

### ***Port's Infrastructural Condition***

The nautical accessibility for the three ports is quite different from each other. The port of Amsterdam is characterised as a lock system port as is the port of Antwerp is partially. As the main container operations with the port of Antwerp are executed in front of the lock complex, in tidal river waters, it will not be designated a lock port. The port of Rotterdam is directly accessibility from deep water.

The nautical accessibility, as one of the main issues for the infrastructural basis [Lirn *et al.*, 2004; Song and Yeo, 2004], will be discussed next for the port of Amsterdam and will be put in perspective with the other ports. Central in this discussion are the lock complex and the port's access canal, the North Sea canal.

### ***The Sea Lock Complex***

A lock system has the advantage of ruling out tidal differences that might facilitate load and discharge operations. It offers a continuous 24 hour port access. It is disadvantages that dominate the conversation, however. Load and discharge problems that accompany tidal differences are mainly caught up with by today's technology being applied in quay cranes etc. The disadvantages that accompany a lock complex are not ruled out that easily.

What follows is an overview of the bottlenecks that might be encountered with Amsterdam's lock complex in case of increasing inbound and outbound flows of cargo:

- The vulnerability of the lock system
  - The risk of encountering damage upon entering the large North-lock depends on a combination of wind force and direction. A negative advice is given when wind forces exceed six Bft. and wind blowing from another direction than parallel to the lock. Container vessels in particular are vulnerable to wind force and direction as their draft-height ratio is low [Svitzer Weismuller, 2004]
  - Unexpected jams in the lock complex, in particular jams in the North lock that forms an obligatory link for the large vessels that have a destination beyond the lock [CPB, 2001].
- The dimensions of the vessels calling the port of Amsterdam [CPB, 2001]:
  - The Middle Lock is characterised by a beam restriction, which can only handle vessels of well below Panamax dimensions, leaving the North lock as the only option for a majority of the Deep-Sea vessels calling at the port.
  - With the inevitable arrival of a new generation of vessels, the dimensions of these vessels, with respect to length, beam and draft, might be beyond the dimensions of North lock.

- The outport at the sea-side of the lock complex has been assessed too tight to grant an easy manoeuvring for large vessel.
- The lock process:
  - Liner vessels plan port calls as far as three months ahead. Bulk carriers usually make an unannounced call only 12 to 24 hours before arrival. This could lead to possible additional waiting times for liner shipping [Amsterdam Port Authority, 2004a]
  - The lockage times (including waiting times) at passing [CPB, 2001]

At a certain point in time, heavily depending on the future development for the port of Amsterdam and, until recently, the success of the Ceres Paragon Terminal, the maximum capacity of the lock complex will be reached. The waiting times at the lock complex might increase exponentially from that point [CPB, 2001]: Estimates of total cargo flows for 2020 destined for the port of Amsterdam, under the current lock complex, vary from 64 to 73 million tons (including container traffic). The large difference (14%) between these estimates, however, might have a doubling effect on waiting times; from 165 minutes to 330 minutes [Koopmans, 2003]. These times reflect total waiting times, including delays encountered with the lock processes but also possible waiting times that stem from problematic passages at the North Sea canal, to be discussed in the later on this section.

As a result of congestion at the lock complex liner vessels will take evasive measures. This will lead to stagnation of the volume growth for the Amsterdam port area. The first to make evasive manoeuvres, involving extra costs, are the container carriers as they experience the highest costs that accompany waiting times. Moreover, a considerable amount of cargo might head for foreign destinations, through which additional loss of prosperity for the Netherlands might be encountered.

The outlined waiting time problem that might originate from an extra pressure on the North lock and possibly leads to congestions seems to arise especially with an increasing number of container vessels. The construction of an extra lock is apparently an important edge condition for the future success of the container ambitions of Amsterdam and the Ceres Paragon Terminal.

Although it will not offer a solution to all the problems outlined above, an additional new lock would have the following significant benefits [Drewry, 2003]:

- It allows the port of Amsterdam to grow its traffic volume as cargo projections indicate negative growth with the current infrastructure.
- Increase of the number of usable locks (*i.e.* usable by modern commercial Deep-Sea vessels) from two to three, which would provide sufficient capacity to accommodate increasing cargo volumes and associated vessel activity.
- It permits two or even three vessels to transit simultaneously in the new lock, thus helping to constrain lock operating costs, and further increase lock capacity.
- It makes the capture of significant container traffic volumes more feasible by reducing or even eliminating potential congestion at the locks.

In a research report prepared for the Dutch Ministry for Transport, Drewry Shipping Consultants [2003] arrived at some interesting numbers when the current lock situation is

compared to a situation with an additional lock; Forecast developments with respect to average container vessel size calling the port of Amsterdam in 2020, show an average size of 4,223 TEU versus 5,698 TEU for both scenarios respectively [Drewry, 2003]. The present lock has dimensions that allow the latest generation of container vessel. The margins are very small, however. The dimensions of the projected new generation of vessels will not be able to pass the lock. Stagnation of the average size of a container vessel will be encountered eventually without a new lock, therefore.

The assumption made here, is that major customers are to be won with the introduction of a new lock. Dependent upon the lock infrastructure provided, new lines will be won that are active in the two European East-West trunks (i.e. to Asia and to North America) and that there will also be some additional North-South trade traffic as well. The capture of a main Europe-Asia trade service would be a potential catalyst for a broadening of the services using the port, due to the generation of inter-line possibilities.

A decision concerning a new lock has been postponed. Costs are high, as they are estimated to be between 450 and 550 million euro. The central government, one of the main stakeholders with respect to this issue, is not yet convinced of the necessity of a new lock. The construction of a new lock will not be started with on a short notice. In addition to this infrastructural bottleneck another might present itself when the number of ship movement to and from the Amsterdam port area rises. It has to do with its access canal; the North Sea canal.

#### *The North Sea Canal*

As the canal has limited dimensions the influence of wind, water displacement by the vessels and the (few) turns in the canal, might lead to problematic ship passages. This can lead to additional waiting times. The number of problematic passages nowadays is still acceptable, being restricted to some meetings per week [Temmerman, 2002]. With the realisation of the Ceres Paragon Terminal container vessels, categorised in the largest vessel section, were also expected to call the port on a frequent basis. If decided in favour of the new lock, more and larger vessels should be able to call the port. For this reason it was expected that the probability of difficult, or even impossible, passages on the North Sea canal would increase in the future.

Some suggestions, to control or overcome these North Sea canal limitations, have been put forward therefore [Temmerman, 2002]:

- Broadening of the canal: The North Sea canal has a bank relating 1 to 3 that confiscates 100 meters of the width of the waterway, since to total surface width is 270 meter and the canal's fairway comprises only 170 meter. When 'dam walls' are created at the edge of the banks and the banks are dug off to a depth of 15 meters or beyond, a waterway arises that is 270 meters wide instead of current 170 meters. This could be applied particularly at 'turning points' of the canal. The disadvantage of these dam walls is the reflection of waves that might have negative consequences for the vessels sailing the canal.
- Limitation of wind: Since the vessels sailing the North Sea canal seem sensitive to wind a solution might be found in the placement of wind awnings alongside the canal. Again, particularly at the turnings. The transverse winds will have less influence, in the form of drifting, on particularly the larger vessels.

When no measures are taken, serious nautical access obstructions for sea shipping was expected by the year 2010. These will definitely have consequences for the international competitive position of the port as waiting times will be raised to an unacceptable level. To offer an acceptable port waiting and transit time, the Amsterdam port area should consider its options.

The disadvantages that accompany the nautical accessibility stand in strident contrast to a (tidal) port such as Rotterdam. A direct, deep water connection to sea, however, does not always mean a win-win situation as is the case for the port of Rotterdam. The port of Antwerp, for instance, experiences severe problems when it comes to tidal differences as the port's nautical entrance, the Westerschelde, is characterised by shallow waters at low tide. Vessels have to follow strict procedures to enter the port of Antwerp to prevent running aground, thereby experiencing additional waiting times. Transit times may add up to 6 hours before a container vessel berths. It might be expected that this problem will be solved in the future, however. Due to recent agreements between the government of The Netherlands and Belgium, the Westerschelde will be dredged and as a result will be made more accessible for large containerships [NRC, 2005].

Table 2 gives an overview of numbers with respect to nautical accessibility, as it forms the main aspect with respect to the port's infrastructural basis, and the accompanying vessel transit times.

#### XXX INSERT TABLE 2 XXX

The infrastructural bottlenecks discussed for the port of Amsterdam, however, can not be held solely responsible for the failure of the Ceres Paragon Terminal. Current lock capacity is still more than sufficient and problematic passages were expected only extreme cases and with higher numbers on traffic. Container vessels can safely call the port of Amsterdam the first years. When realistic predictions of future problems arise, instead of the current scenarios being sketched, enough time will be granted to decide on further developments of the nautical accessibility. Lock capacity, however, needs primacy here, as the presented problems with respect to the canal find are based on intangible simulation studies. They need not to be rejected or neglected for that though.

#### ***Intermodal Linkage***

The lock process and the North-Sea canal transit create some levels of uncertainty with respect to transit times. These are however, not fully insuperable. So there must be other reasons that have led to the failure of the Ceres Paragon Terminal. Some doubt the capabilities of the port of Amsterdam with respect to hinterland connectivity.

#### ***Truck***

The port area is situated right on the A10 and A9 motorways, an area that is characterised by congestion on a regular basis. These congestions are not solely applicable to the Amsterdam area. A large part of the Benelux' road network is characterised by heavy traffic and congestion, as is also the case for the Rotterdam and Antwerp port areas. Some carriers are foreseeing difficulties, however, for the road connection(s) between

Amsterdam and Rotterdam, characterised by frequent and major congestions [Rotterdams Dagblad, 2004].

Plans have been presented for improvement of the road system in the Amsterdam port area. The 'Westrand'-road will be a new connecting road between the 'Coen'-tunnel (A10) and the A4/A9 highways. The first part of the road (designated A5) opened November 2003 and connects the A4, along Schiphol Airport, with the A9. With the construction of the remaining part, planned for the 'Westrand'-road (between the A9 and the port area), Schiphol Airport Amsterdam will be accessible within 15 minutes. The second part is planned to be delivered in 2008. The 'Coen'-tunnel, a known bottleneck, is to be widened. The number of lanes will increase from four to eight. Two of those will be rush hour 'exchangeable' lanes with the possibility of offering five lanes in the busiest direction. This second 'Coen'-tunnel will be finished in 2010 [Amsterdam Port Authority, 2004a/b].

As other port areas are also characterised by heavy traffic and frequent congestion, hinterland connectivity by road was therefore not directly a factor that stood in the way of success for the Ceres Paragon Terminal.

### *Train*

The port of Amsterdam is properly served with railway connections. These make the European hinterlands fully accessible. The port has its own marshalling yards and connections to main railway systems. There is a Rotterdam-Amsterdam shuttle with an international rail connection to Belgium, France, Switzerland and beyond. A certain form of dependency of Rotterdam remains, however. Container transports originating in Amsterdam are only indirectly connected to their final international destination as transports head for Rotterdam first.

Amsterdam will shortly connect to the 'Betuwe'-line at Geldermalsen, however. The 'Betuwe'-line is a 'freight only' rail shuttle link between Rotterdam and Amsterdam in the West (independent of each other), and the German border in the East.

Hinterland connectivity by rail is not ideal at present day but will be in the near future as it becomes independent of the port of Rotterdam. Again, issues on rail connectivity do not offer a convincing piece of evidence in the failure of the Ceres Paragon Terminal.

### *Barge*

Of all goods transport to and from Amsterdam over one third takes place through inland barge shipping. The port of Amsterdam connects to the Rhine-river through the 'Amsterdam-Rhine'-canal, thereby connecting the city to the European hinterlands. Both industrial and consumer markets in the Netherlands, Germany, Austria and Switzerland can be served rather quickly (no obvious congestions), and efficiently (economies of scale versus speed).

The big advantage the 'Amsterdam-Rhine'-canal has over the waterways connecting Rotterdam and Antwerp to the river systems is the absence of current. This leads to considerable time and fuel gains.

When the situation for all three modalities added up, it does not form a very convincing piece of evidence in the case of hinterland connectivity being an important reason for the failure of the Ceres Paragon Terminal.

### ***Handling Costs of Containers***

The Ceres Paragon Terminal was not able to attract carriers on a contractual basis. Fixed cost, therefore, added up in absence of a frequent and considerable income. As a final means to attract customers and to cover a fraction of the costs, the terminal decided to offer their services for relatively low handling costs. This port choice criterion was identified by main stakeholders in the sector as most important. The tariffs charged by the terminal formed only a marginal part of those of competing terminals. It had no effect on carriers, however. The cranes of the Ceres Paragon Terminal remained silent.

When we review the port choice criteria for the port of Amsterdam a number of flaws can be identified: the lock complex and the North Sea canal having its effect on the port's nautical access, and the port's intermodal linkage influence on hinterland connectivity. None of them seem to lead to such a fatal judgement for the Ceres Paragon Terminal. Even adding up the flaws can not fully explain the failure of the terminal as most of the flaws are not yet reality and can be overcome in the future. Especially when these are contrasted with the terminal's capabilities and the low handling tariffs charged.

Other influences must be the main instigator for the failure of the Ceres Paragon Terminal. Maybe the position of the competitive container port of Rotterdam, established nearly four decades ago and massive in size, offers an explanation.

### ***Port Politics***

ECT, the leading terminal operator in Rotterdam, basically handles all the major carriers and binds them through contracts (although Maersk and Sealand have their own dedicated terminal). The power that is gained through these contracts might be stronger than suspected. A striking example is formed by a situation encountered in last year's October: Carrier APL, frequently calling the port of Rotterdam, chose to call the port of Amsterdam as waiting times at ECT, at that moment in time, were not acceptable. The Ceres Paragon Terminal discharged 2,300 containers that were transported back, by train, to the port of Rotterdam. Due to contractual agreements ECT eventually summoned APL to still moor at the port of Rotterdam, even with the all containers destined for Rotterdam already being discharged in Amsterdam.

The terminal operator is not the only constraining factor in the process of a possible port shift, from Rotterdam to Amsterdam. The container carriers are operating in alliances to gain scale advantages and cost reductions. One of the main shareholders of the Ceres Paragon Terminal, NYK, is a member of the Grand Alliance. P&O Nedlloyd is also an important member of this alliance. It has considerable interests with the port of Rotterdam and a strong hand in the alliance. Lobbying attempts by NYK, to draw attention to the Amsterdam based terminal, were tempered by P&O Nedlloyd veto rights.

## **Future of the Ceres Paragon Terminal**

Only one viable option, with respect to the container ambitions of Amsterdam, remains in a situation where a take-over by ECT becomes reality; the use of the Ceres Paragon Terminal as an overflow for ECT's terminal operations. But as ECT is planning to

increase its capacity by expanding its existing terminal area, chances for Ceres Paragon diminish. ECT plans to increase its capacity with 53 percent during the coming 18 months [ECT, 2005]. Quays and berths have been developed and six gantry cranes are on the order book. More cranes, however, are necessary to realise the expansion. Ceres Paragon has nine state-of-the-art post-Panamax gantry cranes standing inoperable. It seems like a marked opportunity for ECT to obtain these cranes easy, quickly and rather 'cheap'.

It is questionable, however, if cooperation between both ports, by using Ceres Paragon as an overflow, would not lead to a greater competitive power on the long term. Here competitive power as a nation is emphasised, not as a city or sole organisation, thereby spreading risk and uncertainties. The port of Antwerp signed a protocol agreement with the second Belgian port of Zeebrugge. The two ports entered into a partnership whereby they will work together to strengthen their positions in regards to international container traffic. In the long term, the agreement may see the two become a single Antwerp-Zeebrugge port complex [Pethick, 2000]. Projects like these are keeping the port of Antwerp competitive with its European rivals.

## **Concluding Remarks**

With respect to important port choice criteria, the container ambitions of the port of Amsterdam seem justified, although a number of problems have to be overcome. Especially infrastructural issues with regard to the lock complex, the access canal and hinterland connectivity have to be solved but are not insuperable.

With a revolutionary and highly productive concept, an enormous growth market, a forthcoming capacity shortage with competitors, an advantageous geographical location and low handling costs, a number of important (success) factors presented itself to make things work. The Ceres Paragon Terminal, however, was not able to position itself in the North-West container port arena. The economical and political power of the leading parties in the massive container port of Rotterdam seems to play a role, either directly or indirectly, in the failure of the Ceres Paragon Terminal.

A forthcoming take-over of Ceres Paragon by ECT leaves open only one viable option for the container ambitions of Amsterdam; the use of Ceres Paragon as an overflow for ECT's terminal operations. Such an option, however, seems improbable as ECT is planning to increase capacity by expansion of its own existing terminal area. The gantry cranes that decorated skies for one and pollute it for another, might trade in the Amsterdam sky for the Rotterdam sky on the short term. A long term national cooperation between an established and a candidate container port, to face the fierce European competitive situation, seems not to be given a chance.

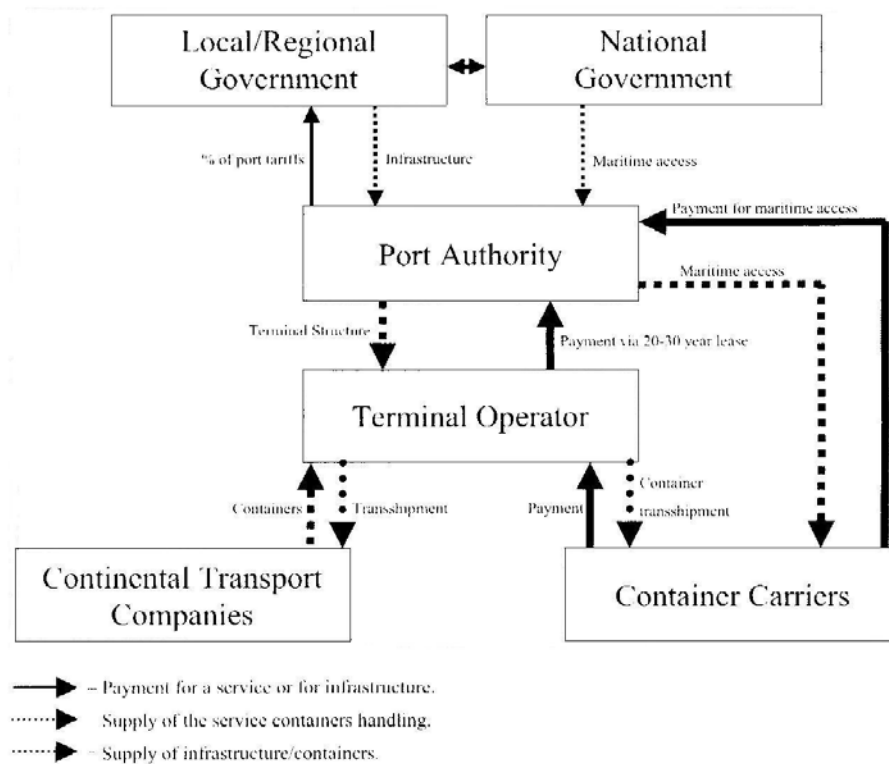


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**Figure 1:** Relationships between stakeholders in a container terminal process  
[Wiegmans, 2003]



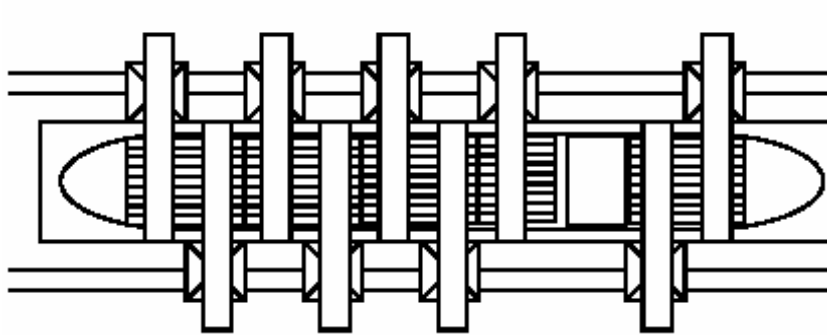
**Figure 2:** Different routing to one particular hinterland destination  
[Kroon, 2004]



**Figure 3:** The Amsterdam Seaport area and the sea lock complex at IJmuiden  
[Ceres, 2004]



**Figure 4:** Docking situation at Ceres Paragon Terminal Amsterdam [Zanen, 2002]



**Table 1:** Terminal comparison between the main container terminals in Amsterdam, Rotterdam and Antwerp: Ceres Paragon Terminal, ECT Delta-Terminal, North Sea-Terminal [Ceres, 2004]

	Amsterdam		Rotterdam	Antwerp
Terminal	Paragon		ECT Delta	North Sea
Operator	Ceres/NYK		ECT	Hesse-Noord Nation
	Indented	Marginal		
Berth length (m)	400	612	4,500	1,200
Water depth (m)	13.7	13.7	16.6	14.3
Terminal area (hectares)	54		236	80
Reefer plugs (units)	433 (850 later)		2,696	660
Annual capacity	1,000,000		4,100,000	1,500,000
Main type of operation	Straddle Carrier		AGV	Straddle Carrier
Gantry cranes	9		25*	10*
Outreach	22 slots		16-18 slots	18-20 slots
Productivity per berth (units/h)	250-300		70	110
Ship cargo operation	24 hours		24 hours	24 hours

\* Being expanded

**Table 2:** Navigation comparison between the ports of Amsterdam, Rotterdam and Antwerp [Ceres, 2004]

	Amsterdam	Rotterdam	Antwerp
Terminal	Paragon Indented Berth	ECT Delta	North Sea
Operator	Ceres/NYK	ECT	Hesse-Noord Nation
Length of Waterway			
Pilot station – Lock (km)	16	19	122
Lock – Berth (km)	12		
Width (m)	275.0		>300
Acceptable draft (m)	13.7	22.5	14.5
Water depth (m)	13.7	24.8	14.0
Time (average, hours)			
Pilot station - Lock	1.0		
Lock transit	0.75	2.0	6.0
Lock – Berth	1.75		
Total duration			
Pilot station – Berth	3.5	2.0	6.0